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Vapor sorption of organic compounds on human serum albumin

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Abstract

Sorption isotherms were measured for a series of organic compounds from the vapor phase on dried solid human serum albumin (HSA). Parameters of the Brunauer-Emmet-Teller (BET) isotherm were evaluated from experimental data. A nonlinear trend was observed between the volume of a filled 'monolayer' and the molar volume of organic compounds. The effective 'monolayer' volume quickly decreased with increase in sorbate molar volume. Larger molecules have less space available for sorption on solid HSA. This shows that the size of molecules is important factor determining the number of available places for sorption on HSA. The sorbate-protein interactions are sensitive also to the structural differences between n-and iso-isomeric sorbates. The Gibbs energy RTInKR for the sorbate transfer from the gas phase standard state to the state to the state of an Infinite by diluted sorbed compound (at zero sorbate activity) with uptake 1 mol kg-1 was calculated from the BET parameters. This Gibbs energy of the gas phase-protein phase transfer corresponds to the distribution coefficient KR similar to the Henry coefficient. A correlation was found between RTInKR values and the molar volume of sorbates. As distinct from the behavior typical for organic solvents, larger molecules are more distributed to the gas phase in comparison with smaller compounds. The positive increment of a methylene group to the gas-protein transfer Gibbs energies was also estimated from data for aliphatic alcohols. This increment is higher than the analogous value evaluated from the Gibbs energies of hydration of the same alcohols. The sorption phenomenon was interpreted in terms of dissolution of organic compounds in the protein phase. It demonstrates a superficially repulsive effect for the organic molecules sorbed in solid HSA. © 1997 John Wiley & Sons, Ltd.

Keywords

Human serum albumin, Organic compounds, Vapor sorption